The Subgenera of *Dubautia* (Compositae): Hawaiian Plant Studies 18[1]

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THE SUBGENERA OF *Dubautia*

THE SHRUBBY or arborescent Compositae of the Hawaiian Islands have attracted much attention and study. Among them are the related genera *Dubautia* and *Railliardia,* early described by Gaudichaud and maintained by nearly every investigator to the present. They were separated by characters of the involucre, paleae, and pappus. Many of the botanists who have done field work in Hawaii got their first concept of *Dubautia* from *D. plantaginea,* a vigorous small tree of the mountains of Oahu. Its involucre of 4 to 6 firm distinct bracts and its terminal plume of crowded oblong-oblanceolate leaves, glabrate on the surfaces, give it a very marked habit and aspect. In *Railliardia* there are numerous species—small bushes with sessile and coriaceous, often decussate, leaves which clothe the stem for a considerable distance. The involucre is cylindric or campanulate, of several involucral bracts united into a tube. Once formed, it is difficult to break away from this concept of the two old genera, but *R. arborea* Gray and *R. struthioloides* Gray are trees; and *R. lonchophylla* Sherff, though a shrub only 3 to 4 feet tall, has foliage similar to that of *D. plantaginea.* Thus, if all the known species are examined, it is evident that there can be no consistent groupings of the species into several genera on the basis of stature, foliage, or involucre.

In a review of *Dubautia* and *Railliardia,* Keck (1936: 24–25) emphasized the existence of species invalidating each one of the several characters alleged to separate the two genera. The two genera had recently been monographed, but Keck asserted (p. 25) that the monographer "Sherff gives an admirable systematic account of the species, but evades the question of how the two genera are to be distinguished by failing to raise it."

To one acquainted with the plants in the field there is no habital aspect to separate the species into two groups and, as indicated, there are no strong morphological differences, not even a single constant character. Keck's merging of the two genera has not been generally adopted, inasmuch as the following botanists have continued in the maintenance of both *Dubautia* and *Railliardia:* Sherff (1941: 29–30); Degener (1940 and 1946); and Selling (1947: 330–332), who gave the first detailed account of the pollen of the Hawaiian plants. Selling accepted both *Dubautia* and *Raillardia* [=*Railliardia*], and, referring (p. 331) to Keck's reduction, said "there seems to be no proper reason for this." Selling describes and illustrates pollen of the two genera, describing it in almost identical phrasing. He states that one cannot separate *Railliardia* from *Dubautia* on the basis of structure of the pollen grains. This might sound like a significant fact, but also inseparable on the basis of pollen structure, are the

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[1]This is the eighteenth of a series of papers designed to present descriptions, revisions, and records of Hawaiian plants. The preceding papers have been published in *Bernice P. Bishop Mus., Occas. Papers* 10(4), 1933; 10(12), 1934; 11 (14), 1935; 12(8), 1936; 14(8), 1938; 15(1), 1939; 15(2), 1939; 15(22), 1940; 15(28), 1940; 17(12), 1943; *Calif. Acad. Sci., Proc.* IV, 25(16), 1946; *Torrey Bot. Club, Bul.* 72: 22–30, 1945; *Lloydia* 7: 265–274, 1944; *Pacific Sci.* 1: 5–20, 1947; *Brittonia* 6(4): 431–449, 1949; *Gray Herb., Contrib.* 165: 39–42, pl. 3, 1947; *Pacific Sci.* 3(4): 296–301, 1949.

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genera *Lagenophora, Tetramolopium, Argyroxiphium,* and other genera with the "*Dubautia* type pollen." So, at least, the pollen structure provides no significant differences between *Dubautia* and *Railliardia.* Selling twice accompanied Skottsberg on field trips to the Hawaiian Islands and Selling's rejection of Keck's work seems in harmony with that of his elder companion, Skottsberg. Skottsberg (1944: 510) discounted Keck's revision. He discussed Keck's evaluation of the characters and consequent fusing of the two genera under *Dubautia,* and said, "I cannot find, however, that he has brought to light any new circumstances, not known to Hillebrand, Sherff, Degener and other writers on this subject, and they have considered it better to keep them separate. Nothing is gained by uniting them." Then Skottsberg described a new species of *Raillardia {= Railliardia}.* To this it may be replied that the gain attained by Keck is the delimiting of a genus with diagnostic characters that can be stated in words by one botanist and applied with the same understanding by others. The reduction of *Railliardia* to *Dubautia* is here accepted. The only recent authors accepting the view of Keck seem to be Hartt and Neal (1940: 264), Fosberg (1943: 395–397 and 1948: 115), and Neal (1948: 743). Fosberg, in his "Summary of the Hawaiian Seed Plants," places *Railliardia* as a synonym of *Dubautia* and indicates that it is a descendant of the original immigrant *Argyroxiphium.*

Of the several characters previously used for generic separation, the best and most significant are those of the freedom or union of the involucral bracts and the degree of ciliation of the pappus. Both of these characters are significant and have always been used in the classification of these species into larger groups. However, the two pairs of characters are not always correlated. Six species have the involucre of separate bracts, and the pappus awns short ciliate lacerate or short ciliate, these representing *Dubautia* of Gaudichaud. Twenty species have the involucral bracts united into a campanulate or funnel-form involucre, and the pappus awns long plumose, these representing *Railliardia* of Gaudichaud. There remain three species, all from Kauai, which have the involucre campanulate, united for from ¼ to ¾ of its length, and the pappus awns short ciliate. These three perfectly recombine the characters of the two older groups. As they cannot be logically fitted into either of these groups, a new subgenus, *Mixta,* is made to receive them; the other two groups are described as subgenera.

Keck removes the Hawaiian genera *Dubautia* and *Railliardia* from the Madieae and, quoting Bentham's opinion, refers to their being likened to *Robinsonia* and *Rhetinodendron* of Juan Fernandez. The similarity is in their habit of growth as small rosette trees, but in characters of flowers and fruit there are fundamental differences from these genera of the Senecioneae. Keck inclines towards the views of Skottsberg that close relatives are *Bedfordia* of Australia and *Brachionostylum* of New Guinea. These are both of the Senecioneae, and, on analysis of their characters, are markedly different. *Bedfordia* is a genus of two species of Tasmania and Victoria in Australia—shrubs or trees with stellate tomentose leaves, heads axillary or in axillary panicles, and the denticulate capillary pappi very numerous and caducous. *Brachionostylum* is a monotypic genus from the high mountains of southwest New Guinea —a shrub with the heads unisexual, heterogamous, anthers free, and the pappus bristles slender, capillary, roughened, and early caducous. On comparison, neither of these genera has the habit, or similarity of flower and fruit structure, to suggest that it is a close relative of *Dubautia.*

Keck agrees with the Engler and Prantl system in placing the Hawaiian *Dubautia* and its relatives in the Heliantheae-Galinsoginae; that seems the best placement at present, though by its structure and habit it is not a

close relative of the other genera currently assigned to that subtribe, and those species with a smooth receptacle wholly lacking chaff are least satisfactorily placed there. Hence, the fact that all the other genera placed there are American does not necessarily imply that *Dubautia* is of American parentage. The Galinsoginae are a group transitional to the Helenieae. The Senecioneae also has to be considered, and it is worthy of note that in the Engler and Prantl key to the Compositae the old genera *Dubautia* and *Railliardia* are included in the keys of all three of these tribes. Investigations in search of a closely related genus have been made in these three tribes, but the writer must report that he failed to find one.

Key to Subgenera of *Dubautia*

Involucral bracts distinct; pappus bristles short ciliate or lacerate-ciliate . *Eudubautia*
Involucral bracts united for part of their length,
Pappus bristles long plumose . . . . . *Railliardiaster*
Pappus bristles short ciliate . . . *Mixta*

Genus Dubautia Gaud.

Subgenus *Eudubautia* subgen. nov.

Dubautia Gaud., Voy. Freycinet Uranie, Bot. 469, (1826) = 1830; Atlas pl. 84, 1826.

Type species: *D. plantaginea* Gaud., l. c.

Bracteae involucri liberae. Aristae pappi ciliati-laceratae vel breve ciliati.

Bracts of the involucre distinct. Pappus bristles squamose, ciliate-lacerate, or usually short plumose.

Enumeration of Species

Dubautia Knudsenii Hbd., Fl. Haw. Is. 223, 1888.

D. laxa H. & A., Bot. Beechey Voy. 87, 1832.

D. laevigata Gray, Amer. Acad. Arts and Sci., Proc. 5: 135, 1861.

D. magnifolia Sherff, Amer. Jour. Bot. 20: 616, 1933.

D. microcephala Skottsb., Hort. Gotoburg., Acta 2: 277–280, fig. 8, 1926.

D. plantaginea Gaud., Voy. Freycinet Uranie, Bot. 469, (1826) = 1830; Atlas pl. 84, 1826.

Subgenus *Railliardiaster* subgen. nov.

Railliardia Gaud., Voy. Freycinet Uranie, Bot. 469, (1826) = 1830; Atlas pl. 83, 1826.

Type species: *R. linearis* Gaud., l. c.

Bracteae involucri cohaerentae, involucrum tubulosum vel anguste campanulatum infundibuliformeve est. Aristae pappi longe plumosae.

Bracts of the involucre united into an involucre tubular or narrowly campanulate or funnelform. Pappus bristles usually long plumose.

Enumeration of Species

Dubautia arborea (Gray) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 28, 1936.

Raillardia arborea Gray, Amer. Acad. Arts and Sci., Proc. 5: 134, 1861.

D. ciliolata (DC.) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 26, 1936. *Railliarda ciliolata* DC., Prodr. 6: 441, 1837.

D. coriacea (Sherff) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 27, 1936. *Raillardia coriacea* Sherff, Bot. Gaz. 95: 80, 1933; later as *Railliardia coriacea* Sherff, Bernice P. Bishop Mus., Bul. 135: 122, 125, fig. 40, 1935.

D. demissifolia (Sherff) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 27, 1936.

Raillardia demissifolia Sherff, Bot. Gaz. 95: 78, 1933; later as *Railliardia demissifolia* Sherff, Bernice P. Bishop Mus., Bul. 135: 118–120, fig. 38, 1935.

D. Hillebrandi (Mann) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 28, 1936 (as *D. Hillebrandii*).
Raillardia Hillebrandi Mann, Amer. Acad. Arts and Sci., Proc. 7: 175, 1867 (as *Railliardia Hillebrandii* Mann in Sherff, Bernice P. Bishop Mus., Bul. 135: 126, 1935).

D. kohalae (Skottsb.) comb. nov.
Raillardia Kohalae Skottsb., Hort. Gotoburg., Acta 15: 510–511, 1944. The specific name is a geographic one, taken from the type locality in the Kohala Mts., and hence, following Rec. XLIII of the International Rules, should be written with a small initial letter.

D. latifolia (Gray) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 26, 1936.
Raillardia latifolia Gray, Amer. Acad. Arts and Sci., Proc. 5: 132, 1861.

D. linearis (Gaud.) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 27, 1936.
Railliardia linearis Gaud., Voy. Freycinet Uranie, Bot. 469, (1826) = 1830; Atlas pl. 83, 1826.

D. lonchophylla (Sherff) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 27, 1936.
Raillardia lonchophylla Sherff, Amer. Jour. Bot. 20: 619, 1933; later as *Railliardia lonchophylla* Sherff, Bernice P. Bishop Mus., Bul. 135: 122, fig. 39, 1935.

D. Menziesii (Gray) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 28, 1936.
Raillardia Menziesii Gray, Amer. Acad. Arts and Sci., Proc. 5: 133–134, 1861.

D. molokaiensis (Hbd.) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 27, 1936.
Raillardia Molokaiensis Hbd., Fl. Haw. Is., 226, 1888.

D. montana (Mann) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 28, 1936.
Raillardia montana Mann, Amer. Acad. Arts and Sci., Proc. 7: 176, 1867.

D. platyphylla (Gray) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 28, 1936.
Raillardia platyphylla Gray, Amer. Acad. Arts and Sci., Proc. 5: 134, 1861.

D. reticulata (Sherff) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 28, 1936.
Raillardia reticulata Sherff, Bot. Gaz. 95: 78, 1933; later as *Railliardia reticulata* Sherff, Bernice P. Bishop Mus., Bul. 135: 128, 130, fig. 41, 1935.

D. Rockii (Sherff) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 28, 1936.
Raillardia rocki Sherff, Bot. Gaz. 95: 79, 1933; later as *Railliardia Rockii* Sherff, Bernice P. Bishop Mus., Bul. 135: 130–131, 1935. The change from *R. rocki* to *R. Rockii* was made by Sherff himself in his second discussion of the species. Though he quoted the original specific name incorrectly as *Rockii,* still this second one is an acceptable form of a personal specific name, and it can be adopted as a correction by the author himself of a typographical error.

D. scabra (DC.) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 26, 1936.
Railliarda scabra DC., Prodr. 6: 441, 1837.

D. Sherffiana Fosb., Torrey Bot. Club, Bul. 70: 395–397, 1943. (See fig. 1.)

D. struthioloides (Gray) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 28, 1936.
Raillardia struthioloides Gray, Amer. Acad. Arts and Sci., Proc. 5: 134, 1861.

D. ternifolia (Sherff) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 27, 1936.
Raillardia ternifolia Sherff, Amer. Jour. Bot. 20: 618, 1933; later as *Railliardia ternifolia* Sherff, Bernice P. Bishop Mus., Bul. 135: 121, 1935.

D. thyrsiflora (Sherff) Keck, Bernice P. Bishop Mus., Occas. Papers 11(19): 27, 1936.
Raillardia thyrsiflora Sherff, Amer. Jour.

Bot. 20: 618, 1933; later as *Railliardia thyrsiflora* Sherff, Bernice P. Bishop Mus., Bul. 135: 121–122, 1935.

Omitted from this enumeration of species are numerous described varieties and forms. Also omitted are the several interspecific hybrids and intergeneric hybrids described by Sherff or by Degener and Sherff. These putative hybrids have not been evaluated and allocated by the writer.

Subgenus *Mixta* subgen. nov.

Type species: *Dubautia railliardioides* Hbd.; the reference follows.

Bracteae involucri plusminusve cohaerentae, involucrum campanulatum est. Aristae pappi brevi ciliati.

Bracts of the involucre more or less united; involucre campanulate; pappus bristles short ciliate.

Enumeration of Species

Dubautia paleata Gray, Amer. Acad. Arts and Sci., Proc. 5: 135, 1861.

D. railliardioides Hbd. (as *D. raillardioides*), Fl. Haw. Is. 224, 1888, emend. Sherff, Bernice P. Bishop Mus., Bul. 135: 107, 1935. Hillebrand published his new species as *D. raillardioides* and discussed its similarity to the next genus, *Raillardia* of Gaudichaud. We must accept this generic name as *Railliardia,* which was the original, well-formed, and valid name. Hence, though there is no covering rule, Sherff took the logical, and, we believe, correct course in changing the specific name to be in harmony with the correct spelling of the generic name. He was not justified in capitalizing the specific name *D. railliardioides* under the 1935 International Rules of Botany, Rec. XLIV, examples, and Art. 3.

D. waialeale Rock, Torrey Bot. Club, Bul. 37: 303–304, f. 5, 1910.

Notes on *Dubautia Sherffiana*

The type collection of *Dubautia Sherffiana* Fosb. is *H. St. John & F. R. Fosberg 12,161,* from Oahu, Waianae Mts., brushy ridge, east of 2nd gulch east of Kaupakuhale, Mokuleia, 2,500 ft. alt., Oct. 23, 1932. At the same time and locality, only 200 feet higher up the same ridge, another collection of this novelty was made *(St. John & Fosberg 12,162)*; but this was not listed in Fosberg's paper.

The species of the subgenus *Railliardiaster* are not common on Oahu, and not until September 18, 1949, did the writer find another colony. When climbing one of the narrow rocky ridges leading to Puu Kanehoa in the Waianae Mountains, he saw below him a patch of unfamiliar yellow flowers. By grasping hands with a student he was lowered over the brink and he grabbed a few sprigs of what appeared to be *Railliardiaster.* Returning the next week, he was roped by his companions, M. Canoso and C. E. St. John, and lowered 20 feet down the vertical basalt cliff. There, on a dirt covered ledge so narrow as to deny a foothold to man, were three vigorous bushes 1–1.5 meters tall, many-branched, with the numerous cymes in full golden flower. After taking photographs and gathering full specimens, the collector was hauled again to a foothold on the knife-edged ridge. The data for these specimens are: Oahu, Waianae Mts., southeast ridge of South Peak of Puu Kanehoa, on face of basalt cliff, 20 ft. below crest of sharp ridge, 2,600 ft. alt., in open sunny spot, at top of thicket of *Metrosideros* and *Euphorbia,* Sept. 25, 1949, *H. St. John 23,924*; and also, *23,922* and *23,923.* Though collected in the southern part of the Waianae Mountains, these specimens proved to be of the same species, *Dubautia Sherffiana* Fosberg, earlier described from the northern part of the range. After studying all of the specimens, including an isotype, the following changes in description are proposed: blades

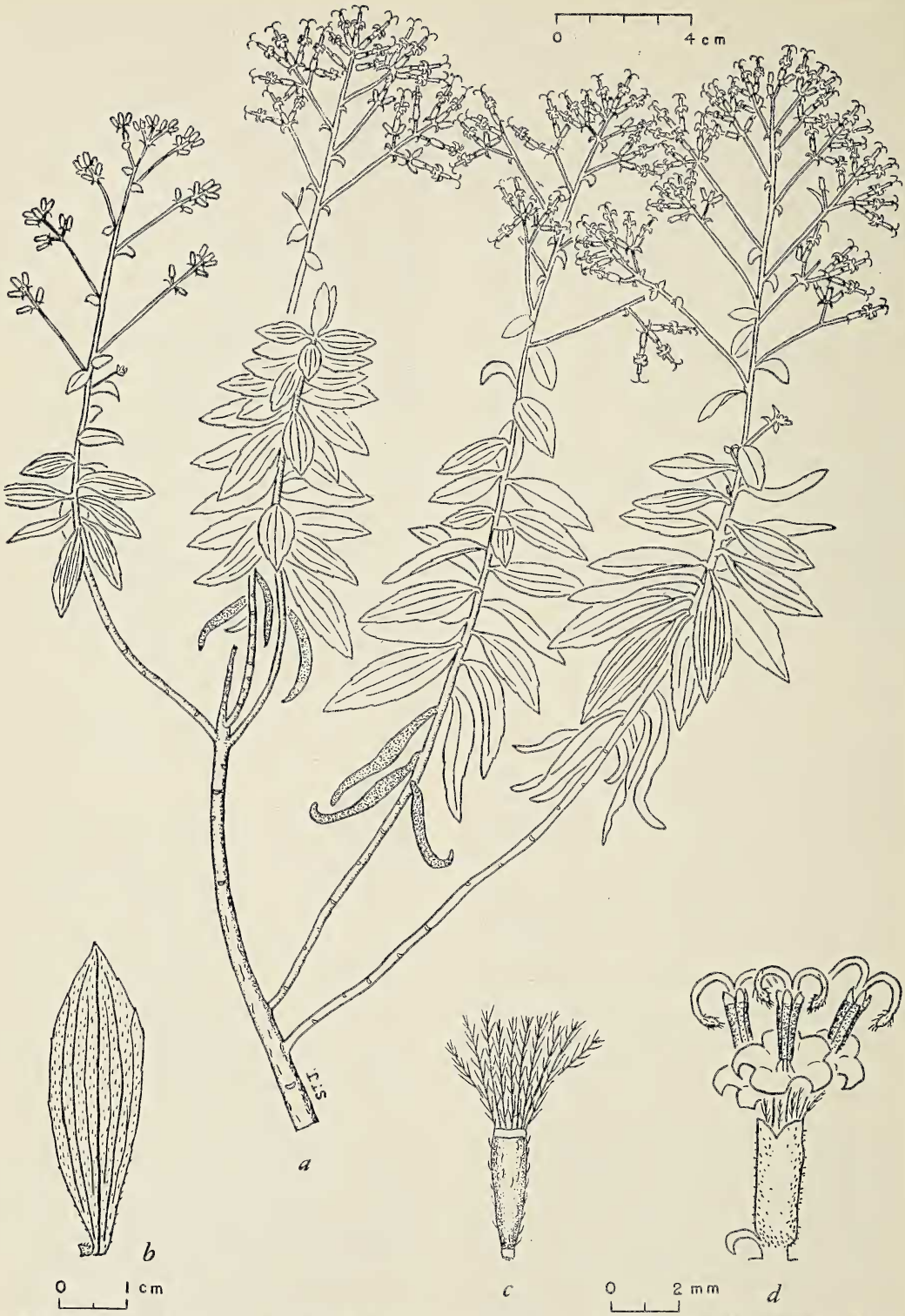

FIG. 1. *Dubautia Sherffiana* Fosb. *a*, habit × ½; *b*, leaf × 1; *c*, achene with pappus × 5; *d*, involucre and flowers × 5. From *St. John 23,924.*

5(–7)-nerved; pappus bristles 16–25 in number, 2.5–3.5 mm. long.

Though the subgenus *Railliardiaster* is rare on Oahu, there are to be considered two published records of its occurrence. Sherff (1935: 113) summarizes the range of *Railliardia scabra* as "Hawaii, Maui, and Oahu." This species is common and Sherff lists nearly a whole page of specimens, but no collection from Oahu is in his list. None is in the Bishop Museum; nor has any other published record been seen, so Sherff's record seems to be an error.

Sherff also lists (1935: 125–126) *Railliardia linearis* Gaud. as on "eastern Maui, western Oahu, Lanai, and Hawaii." For Oahu he cites, U. S. Exploring Expedition, Kaala (Waianae) mountains, Oahu, 1840 (Gray, New York). Since 1840 no other collector has found this species on Oahu, but many have done so on the three more southerly islands. The flora of Oahu is the best known of any island in the group and its montane flora is well preserved. The U. S. Exploring Expedition also obtained specimens of this species on Maui and Hawaii. This expedition was large and well organized but inharmonious. The commander, Capt. Charles Wilkes, had trouble with his officers on the trip and after it, and with the scientists for decades afterwards while acting as editor of the publications of the expedition. In the botanical collections made by this expedition, it is now known that there is much confusion, as often the loose labels with the data were inserted with the wrong specimens. Piper (1906: 15) discussed this in detail, and the evidence is well known. It is probable that the U. S. Exploring Expedition specimen came not from Oahu, but from Maui or Hawaii with their other collections of these species. In any case, their record from Oahu is questionable until confirmed by a well-substantiated collection.

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